

RESEARCH ARTICLE

Opinions of Argentinean neonatologists on the initiation of life-sustaining treatment in preterm infants

Agustín Silberberg¹  | Marcelo José Villar² | Silvio Torres³

¹Department of Bioethics, Hospital Universitario Austral, Facultad de Ciencias Biomédicas, Universidad Austral, Pilar, Argentina

²Institute of Translational Research, Facultad de Ciencias Biomédicas, Universidad Austral, Pilar, Argentina

³Department of Pediatrics, Hospital Universitario Austral, Pilar, Argentina

Correspondence

Agustín Silberberg, Hospital Universitario Austral, Ave Juan Perón 1500 (ex Ruta 234), B1629AHJ, Derqui, Pilar, Buenos Aires, Argentina.
Email: agustinsilberberg@gmail.com

Abstract

Background: In June 2014, the Argentinean Ministry of Health published guidelines for the management of neonates born at the limit of viability (≤ 25 weeks of gestation). We explored the opinion of neonatologists in Buenos Aires, Argentina, regarding the initiation of life-sustaining treatment (LST) in critically ill neonates, focusing on the effect of sociocultural factors on their opinion.

Methods: An anonymous survey was designed to explore the opinions of Argentinean neonatologists on whether or not to initiate LST in newborns born prematurely. Five hundred eighty neonatologists from 36 neonatal units were invited to participate, and 315 specialists from 34 neonatal units completed the survey (response rate 54%). The survey was conducted between June 2014 and February 2015.

Results: 9.5% (30/315) of the neonatologists answered they would begin LST on neonates born at 22 weeks, 42.5% (134/315) at 23 weeks, 37% (117/315) at 24 weeks, 7% (22/315) at 25 weeks, and 4% (12/315) at ≥ 26 weeks. Cumulatively then, 96% of participants stated they would start LST at 25 weeks of gestation or less. On multivariate analysis, a “transcendent” value of life and lack of consideration of the local legal framework for making medical decisions in the delivery room were statistically associated with an opinion in favor of initiation of LST in neonates born at the limit of viability. More than 50% of the Argentinean neonatologists surveyed answered they would initiate treatment at a gestational age of less than 23 weeks, despite the fact that the recommendations of the Argentinean Ministry of Health are to only give comfort care for these neonates. The opinion of most Argentinean neonatologists surveyed thus differs from that recommended by the guidelines of Argentina.

Conclusion: The most frequent opinion of Argentinean neonatologists was to initiate LST in neonates at the limit of viability. Certain factors, in particular the sense of a transcendent meaning to life and lack of consideration of the local legal framework for making medical decisions in the delivery room, seem to influence the decision to start LST.

KEYWORDS

delivery room, ethics, life-sustaining treatment, medical decision making, preterm infants

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2018 The Authors. *Health Science Reports* published by Wiley Periodicals, Inc.

1 | INTRODUCTION

The decision to begin life-sustaining treatment (LST) on critically ill neonates is an internationally debated issue that continues to provoke widespread discussion.¹⁻⁴ The care of babies born at the threshold of viability raises questions about their chances of survival and about their expected quality of life.⁵⁻⁷ It is important that neonatologists question the degree of aggressiveness of their treatment and when to draw the line.

The decision-making process for neonates at the limit of viability differs by country.^{8,9} The index of survival of neonates born at the limit of viability (≤ 25 weeks of gestation) differs significantly according to the weeks of gestation.^{7,10} In Argentina, the laws that govern medical practice for newborn children with a low chance of survival are outlined in the Civil Code of Law. These laws establish that “neonates born alive are subjects of the law independently of the fact that there is no possibility of prolonging life, or that they die after birth or because of being born preterm” (article 72).

In 2014, the Argentinean Ministry of Health published guidelines for the management of newborns, proposing the provision of comfort care to newborns with $\leq 23 + 6/7$ weeks' gestation and the initiation of LST on neonates with $24 + 0/7$ weeks' gestation, after discussing it with their parents.¹¹ The recommendations put forward by the Argentinean guidelines are consistent with the findings of a study by Gallagher et al, which show that specialists from other countries also initiate treatment of neonates at 24 weeks gestation.¹² Other studies, for example, that by Verlato et al, recommend initiating LST at 23 weeks of gestation.¹³

We set out to investigate the opinions of Argentinean neonatologists on whether or not they would initiate LST in newborns with gestation periods close to the limit of viability, taking into consideration the sociocultural characteristics of the decision-making environment in which they work. We also investigated whether the opinions of neonatologists surveyed followed the recommendations of the guidelines of the Argentinean Ministry of Health, considering that these have recently been published.

2 | METHODS

An anonymous questionnaire was designed to obtain the opinions of neonatologists on the management of neonates at the limit of viability. A neonatologist trained to safeguard the anonymity of the answers was in charge of distributing the questionnaire and collecting the completed copies.

The study was carried out in Buenos Aires, Argentina, in a geographic area with 13 600 000 inhabitants and a birth rate of 147 188 neonates per year. Of these, 8.3% are preterm with less than 37 weeks of gestation, representing 20% of newborns in the entire country. Argentina has a high birth rate of approximately 750 000 newborns every year. Moreover, there are numerous socioeconomic challenges, including the fact that 6% and 13% of households are unable to cover basic needs.¹⁴

The study was conducted with neonatologists who worked in neonatal units that met the following inclusion criteria: hospitals with

complexity level III and an annual number of births ≥ 1500 , hospitals with complexity level II and an annual number of births ≥ 2000 , and clinical referral centers for neonatal diagnostics and treatment of surgical pathology with a high level of complexity. Thirty-six neonatal units met the inclusion criteria within the geographic area. A total of 580 specialists who worked in the neonatal units meeting the inclusion criteria were considered eligible and were invited to participate in the study. The study was approved by the ethics committee of the Hospital Universitario Austral and by the ethics committee of each hospital included in the survey. The return of the questionnaire completed by the neonatologists was considered consent to participate.

The survey investigated the opinion of eligible neonatologists on whether or not to initiate LST on neonates born prematurely. Participants were asked a closed-ended question: “In your opinion, which is the minimal gestational age for initiating LST in the delivery room?” They could answer only one of the following options: at 22 weeks, at 23 weeks, at 24 weeks, at 25 weeks, or at ≥ 26 weeks. The questionnaire was specifically designed to evaluate the practice of neonatologists with regard to the decision to initiate LST within the clinical context of the delivery room. For the purposes of the survey, LST was defined as all treatment aimed at maintaining neonatal life, including conventional interventions such as cardiopulmonary resuscitation, mechanical ventilation, and intravenous inotropic support.

The survey also investigated the influence of certain sociocultural factors on the clinical decision making of the neonatologists. In particular, the following issues were explored: (1) age; (2) sex; (3) transcendent meaning of life, understood as a meaning of life that exceeds sensible reality and goes beyond this world (that is to say, a meaning of life that derives from the human longing for an answer that goes beyond the limits of space and time); (4) religious beliefs, when present; (5) financial considerations; (6) local legal framework for medical practice in the delivery room; and (7) type of neonatal unit, public, or private.^{4,9,15}

The sociocultural factors were elicited using the following questions: “Does the transcendent meaning of life (understood as a meaning of life that exceeds sensible reality and goes beyond this world) influence your clinical decisions? (In case of no particular attribution of a transcendent meaning of life, no need to answer this question)”; “Do your religious beliefs influence your medical decisions? (In case of no particular religious belief no need to answer this question)”; “Would the financial burden incurred by the parents in the rehabilitation of their critically ill neonate influence your decision?”; and “Does the Argentinean legal framework influence your medical decisions in the delivery room?” Responses were graded using the Likert scale from 1 to 5 (1 being “always” and 5 “never”).

Regarding age, two groups were created using the mean of the respondent's age (49 years): ≤ 49 and ≥ 50 years. Regarding the influence of religious beliefs, the specialists were also separated into two groups: those who are guided by religious beliefs and those who are not or have no beliefs at all. Likewise, the influence of the legal framework on the practice of specialists in the delivery room led to two groups: those who do not take the law into account and those who do.

The opinion of neonatologists to start treatment was only evaluated regarding neonates at the limit of viability (≤ 25 weeks of gestation). It was analyzed using descriptive statistics. Categorical data

were expressed as proportions, and chi-square tests were used for the initial comparisons between groups. To obtain the *P* value for each of the sociocultural factors, the cumulative number of neonatologists that stated they would start LST at 22, at 23 (ie, 23 or less), at 24 (ie, 24 or less), and at 25 (ie, 25 or less) weeks of gestation was used. *P* < 0.05 was considered statistically significant.

Then, using all sociocultural factors that were independently associated with the neonatologists' opinion to initiate LST, multivariate logistic regression was conducted. The risk measures were calculated, along with their respective 95% confidence intervals (CIs). Mantel-Haentzel tests were used to identify the presence of confounding variables or effect modifiers. Multivariate logistic regression showed the ORs adjusted for each statistically significant associated variable with the variable "decision to initiate LST." Stata 10.0 (California, USA) was used for the statistical analyses.

3 | RESULTS

A total of 315 neonatologists completed the survey (response rate 54%). Their sociodemographic characteristics are shown in Table 1. These specialists worked in 34 of the 36 different neonatal units (unit response rate 94%) in Buenos Aires, Argentina; neonatologists from two of the hospitals were excluded from our study, because they chose not to participate.

TABLE 1 Sociocultural characteristics of neonatologists (n = 315)

Characteristics	n	%
Age, year		
≤49	178	56.5
≥50	137	43.5
Sex		
Female	224	71.1
Male	91	28.9
Transcendent meaning of life		
Yes	241	76.5
No	62	19.7
Don't know	12	3.8
Influence of religious beliefs		
Yes	122	38.7
No	186	59.1
Don't know	7	2.2
Influence of legal framework		
Yes	40	12.7
No	166	52.7
Don't know	109	34.6
Influence of economic resources		
Yes	57	18.1
No	255	81
Don't know	3	0.9
Type of neonatal unit		
Public	189	60
Private	126	40

The number of female specialists in the survey was 70%, consistent with the fact that there are more women neonatologists than men in Argentina. The number of participants who worked in public neonatal units (60%) was higher than the number of those who worked in private units, consistent with the fact that 66% of the neonatal units in Buenos Aires are public.

The opinion of neonatologists as to when to begin LST was as follows: 9.5% (30/315) of the neonatologists answered they would begin LST on neonates born at 22 weeks, 42.5% (134/315) at 23 weeks, 37% (117/315) at 24 weeks, 7% (22/315) at 25 weeks, and 4% (12/315) at ≥26 weeks. Cumulatively, this means that 9.5% (95% CI, 6.2-12.7) would consider starting LST at 22 weeks of gestation, 52% (95% CI, 46.6-59.9) at 23 weeks or less (ie, at either 22 or 23 weeks), 89.1% (95% CI, 85.8-92.5) at 24 weeks or less (ie, at either 22, 23, or 24 weeks), and 96.2% (95% CI, 95.7-96.7) at 25 weeks or less (ie, at either 22, 23, 24, or 25 weeks). The remaining 3.8% (12/315) of participants stated they would only start LST at 26 weeks or more of gestation. Table 2 only shows results of neonatologists' opinion regarding neonates born at the limit of viability (≤25 weeks of gestation).

We observed not statistically significant difference on the neonatologists' decision to initiate LST on neonates at the limit of viability based on their age, sex, or type of neonatal unit in which they worked (Table 2). On the other hand, we observed statistically significant differences based on a transcendent meaning of life, religious beliefs, financial considerations, and consideration of local legal framework for medical practice (Table 2).

Also, through multivariable analysis, we observed that among all significant sociocultural factors evaluated, the acknowledgment of a transcendent meaning of life by neonatologists and lack of consideration of the local legal framework for making medical decisions were significantly associated with the opinion to initiate LST at the limit of viability (*P* < 0.05, Table 3).

4 | DISCUSSION

In developed countries, infants born between 22 and 24 weeks' gestation are within the so-called gray zone, at borderline viability.¹⁶⁻¹⁸ The chances of survival of these neonates vary, according to some international studies.^{19,20} Guillen et al mention that none of the guidelines recommend active care at 22 weeks' gestation, while at 23 weeks' gestation, 13% of the guidelines studied recommend following parental wishes and 35% advocate for individualized care. At 24 weeks' gestation, 19% of guidelines follow parental wishes, 29% individualized care, and 32% active care. At 25 weeks' gestation, all of the guidelines recommend active care. These results vary, in part, depending on sociocultural factors, country of origin of the recommendation guidelines, and the type of treatment strategy.⁸

The Argentinean guidelines of the Ministry of Health published in June 2014 recommend only comfort care for neonates at ≤23 + 6/7 weeks of gestation, and the initiation of LST on newborns at 24 weeks.¹¹ Unfortunately, there is no published data on overall Argentinean neonatal outcomes, a fact that the Argentinean Ministerial guidelines acknowledge. It should be added that some neonatal units have technological and financial deficiencies, which may affect

TABLE 2 Sociocultural characteristics of neonatologists according to their opinion about the initiation of LST^a

n of Participants = 315	Which is The Minimal Gestational Age (in Weeks) for Initiating LST in the Delivery Room?							P value
	At 22 weeks	At 23 weeks	At ≤ 23 weeks	At 24 weeks	At ≤ 24 weeks	At 25 weeks	At ≤ 25 weeks	
n	30	134	164	117	281	22	303 ^b	
Age < 49	17	86	103	60	163	12	175	0.055
Age > 50	13	48	61	57	118	10	128	
Female	21	100	121	83	204	14	218	0.058
Male	9	34	43	34	77	8	85	
Public Neonatal Unit	14	63	77	84	161	17	178	0.061
Private Neonatal Unit	16	71	87	33	120	5	125	
Transcendent meaning of life								
Yes	23	102	125	86	211	20	231	0.001
No	7	27	34	25	59	2	61	
Missing	0	5	5	6	11	0	11	
Influence of religious beliefs								
Yes	16	50	66	41	107	10	117	0.041
No	14	82	96	72	168	12	180	
Missing	0	2	2	4	6	0	6	
Influence of legal framework								
Yes	5	29	34	40	74	12	86	0.039
No	15	81	96	72	168	9	177	
Missing	10	24	34	5	39	1	40	
Influence of economic resources								
Yes	2	26	28	21	49	4	53	0.032
No	27	107	134	95	229	18	247	
Missing	1	1	2	1	3	0	3	

^aNumbers represent those who stated they would start LST at the listed age. The columns "At ≤23 weeks," "At ≤24 weeks," and "At ≤25 weeks" show the cumulative number of neonatologists that stated they would start LST at or before that age.

^bTwelve neonatologists would start LST at ≥26 weeks.

TABLE 3 Logistic regression analysis (predictive model of probability) from variables associated with neonatologists' opinion to initiate LST

	OR (95% CI)	P value
Transcendental meaning of life	4.07 (3.01-10.72)	0.011
Influence of legal framework	2.18 (1.11-20.32)	0.045
Influence of economic resources	1.98 (0.74-5.24)	0.058
Influence of religious beliefs	2.32 (0.91-5.77)	0.061

the care of critically ill neonates. Most of the Argentinean neonatologists surveyed, particularly those who acknowledge a transcendent meaning of life, were of the opinion to initiate LST on neonates at the limit of viability.

According to the data of our study, conducted between June 2014 and February 2015, the opinion of the neonatologists surveyed differs from the recommendation made by the Argentinean Ministry of Health. It should be noted that the recommendations of the Argentinean guidelines are suggestions, without a legal connotation, and only serve as a reference for clinical practice. It is possible that some of the discrepancies between the Ministry's guidelines and the opinion of the Argentinean neonatologists could be due to the recent publication of the guidelines, such that many might have been unaware of the recommendations at the time of the survey. On the other hand, since the guidelines of the Argentinean Ministry of Health

mention the lack of data on local outcomes concerning survival by weeks of gestation, it is possible that neonatologists make their decisions based on their own experience in the neonatal units where they work. Further, the Ministry of Health establishes recommendations for all neonatal units in the country taking into account the existing diversity in technological and financial resources. Given that most of the neonatal units with more resources are located in Buenos Aires, this fact could explain why the neonatologists surveyed were more likely to exceed the ministerial recommendations, based perhaps on the experience and outcomes in their own neonatal units.

The survival of children with a poor quality of life is a great challenge in the decision-making process of neonatologists.²¹⁻²³ There is concern that intensive treatments may lead to prolonged suffering, and it is, therefore, appropriate to question how aggressive neonatologists should be when the chances of survival are minimal despite intensive care.²⁴ Since the opinion of the Argentinean neonatologists surveyed tended toward initiating LST at the limit of viability, there is a risk that some neonates will survive but with severe neurological sequelae. Today, the survival of neonates with neurological impairment is a result of our medical decisions.²³ It could be argued that it is necessary not to prolong the life of a child with serious intercurrent neurological damage.^{3,25} However, who is to say what is serious and how serious it is? Parents and doctors perceive children's disabilities differently.²⁶ Undoubtedly, it is necessary to know what the parents think, because their opinion is of particular

importance at the moment of the final decision regarding treatment.²⁷⁻²⁹

Among the sociocultural factors analyzed in the survey, having a transcendent meaning of life was significantly correlated with the opinion to initiate LST. Interestingly, our data show that a transcendent perspective is not necessarily linked to religious beliefs, since most neonatologists claimed that such beliefs did not influence their decisions. We consider this plausible, given the fact that having a transcendent meaning of life does not imply, in and of itself, any religious practice, nor affiliation to any particular religion. It simply implies a particular outlook on life or the belief that human existence cannot be fully explained from a purely materialistic point of view. However, it is not always easy to demarcate the line between a transcendent outlook on life and religious beliefs. This point is a limitation of our study, because there is a possibility that the neonatologists surveyed did not distinguish between a transcendent outlook on life and religious beliefs.

Why would the transcendent meaning of the doctors' own lives be reflected in a proactive attitude of treatment, up to the point of surpassing in part the suggestions of the Argentinean Ministry of Health and the recommendations of international guidelines? Extrapolating from our data and respecting the limitations of this study, a possible explanation for this fact could be that neonatologists with this outlook are especially motivated to protect life and try to maximize the few chances of survival of neonates at the limit of viability.

There is a predominant opinion to initiate LST in children with 22 and 23 weeks of gestation in private neonatal units compared with public units. However, these quantitative differences were not statistically significant. In any case, it is possible that some differences may exist because of the fact that in Argentinean private neonatal units, there are usually more technical and economic resources as compared with public neonatal units. A larger study with a higher number of participants and institutions may shed light on this aspect.

The other sociocultural factor associated with the opinion to initiate LST was a lack of consideration for the local legal framework when making medical decisions in the delivery room. Only 83 of 303 neonatologists who stated they would start LST at ≤ 25 weeks of gestation expressed that their decisions are influenced by the laws that govern medical practice, compared with 177 who expressed that the Argentinean legal framework does not influence their medical decisions (Table 2).

Why do less than half of the Argentinean neonatologists surveyed expressed that the local legal framework does not influence their medical decision in the delivery room? It is possible that decisions are more related to other factors, eg, transcendent meaning to life of Argentinean neonatologists, their own experience, or reported outcomes from other studies, rather than to the legal context.^{15,30,31} Singh et al noted that neonatologists place little emphasis on lawsuits, finding a similar opinion among neonatologists surveyed working in the delivery room.³²

An additional explanation for the opinion of Argentinean neonatologists could be that it is difficult to establish a legal framework that regulates, in detail, medical decisions as complex as those taken in the delivery room. It would be interesting to reevaluate the significance of this association with a larger sample of neonatologists and units.

5 | CONCLUSION

The opinion of over half of the Argentinean neonatologists surveyed is that the initiation of LST should be considered for neonates born between 22 and 24 weeks of gestation, a finding that is in contrast with the guidelines of the Argentinean Ministry of Health, which only recommend comfort care at this stage.

Some of the important factors influencing the clinical decision of the neonatologists towards initiating LST included a transcendent sense of life and lack of consideration of the local legal framework for making decisions in the delivery room.

FUNDING INFORMATION

Authors of this manuscript have not received any grant or funding from agencies in the public, commercial, or not-for-profit sectors.

CONFLICTS OF INTEREST

Authors have no conflicts of interest to disclose.

FINANCIAL DISCLOSURE

Authors of this manuscript have no financial relationship that could be broadly relevant to this work to disclose.

AUTHOR CONTRIBUTION

Conceptualization: Dr. Agustín Silberberg

Formal Analysis: Dr. Marcelo J. Villar, Dr. Silvio Torres

Writing – Original Draft Preparation: Dr. Agustín Silberberg

Writing – Review & Editing: Dr. Marcelo J. Villar

ORCID

Agustín Silberberg  <http://orcid.org/0000-0003-4693-424X>

REFERENCES

- Geurtzen R, Draaisma J, Hermens R, et al. Perinatal practice in extreme premature delivery: variation in Dutch physicians' preferences despite guideline. *Eur J Pediatr*. 2016;175(8):1039-1046.
- Charafeddine L, Ammous F, Kayle M, Arawi T. Survival at the threshold of viability: a nationwide survey of the opinions and attitudes of physicians in a developing country. *Paediatr Perinat Epidemiol*. 2014;28(3):227-234.
- Weiner J, Sharma J, Lantos J, Kilbride H. How infants die in the neonatal intensive care unit. *Arch Pediatr Adolesc Med*. 2011;165(7):630-634.
- Cuttini M, Kaminski M, Saracci R, De Vonderweid U. The EURONIC Project: a European concerted action on information to parents and ethical decision-making in neonatal intensive care. *Paediatr Perinat Epidemiol*. 1997;11(4):461-474.
- Ancel PY, Goffinet F, and the EPIPAGE-2 Writing Group. Survival and morbidity of preterm children born at 22 through 34 weeks' gestation in France in 2011 results of the EPIPAGE-2 cohort study. *JAMA Pediatr*. 2015;169(3):230-238.
- Marlow N, Bennett C, Draper ES, Hennessy EM, Morgan AS, Costello KL. Perinatal outcomes for extremely preterm babies in relation to place of birth in England: the EPICure 2 study. *Arch Dis Child Fetal Neonatal Ed*. 2014;99(3):F181-F188.
- Seaton SE, King S, Manktelow BN, Draper ES, Field DJ. Babies born at the threshold of viability: changes in survival and workload over 20 years. *Arch Dis Child Fetal Neonatal Ed*. 2013;98(1):F15-F20.

8. Guillén Ú, Weiss EM, Munson D, et al. Guidelines for the management of extremely premature deliveries: a systematic review. *Pediatrics*. 2015;136(2):343-350.
9. Saaman MC, Cuttini M, Casotto V, Ryan CA. Doctor's and nurses' attitudes towards neonatal ethical decision making in Ireland. *Arch Dis Child Fetal Neonatal Ed*. 2008;93(3):F217-F221.
10. Costeloe KL, Hennessy EM, Haider S, Stacey F, Marlow N, Draper ES. Short term outcomes after extreme preterm birth in England: comparison of two birth cohorts in 1995 and 2006 (the EPICure studies). *Br Med J*. 2012;345. e7976
11. Argentine Ministry of Health. Recommendations for management of pregnancy and newborn babies at the limit of viability. Available at: <http://www.msal.gov.ar/images/stories/bes/graficos/0000000513cnt-viabilidad.pdf> (accessed 20 June 2016).
12. Gallagher K, Martin J, Keller M, Marlow N. European variation in decision-making and parental involvement during preterm birth. *Arch Dis Child Fetal Neonatal Ed*. 2014;99(3):F245-F249.
13. Verlato G, Gobber D, Drago D, Chiandetti L, Drigo P. Working group of intensive care in the delivery room of extremely premature newborns. Guidelines for resuscitation in the delivery room of extremely preterm infants. *J Child Neurol*. 2004;19(1):31-34.
14. Ministry of Health. Basic indicators 2014. Available at: <http://publicaciones.ops.org.ar/publicaciones/indicadores/Indicadores2014.pdf> (accessed 1 June 2016).
15. Weiss AR, Binns HJ, Collins JW Jr, de Regnier RA. Decision-making in the delivery room: a survey of neonatologists. *J Perinatol*. 2007;27(12):754-760.
16. Fanaroff JM, Hascoët JM, Ruud Hansen TW, et al. On behalf of the International Perinatal Collegium (IPC). The ethics and practice of neonatal resuscitation at the limits of viability: an international perspective. *Acta Paediatr*. 2014;103(7):701-708.
17. Su BH, Hsieh WS, Hsu CH, Chang JH, Lien R, Lin CH. Premature Baby Foundation of Taiwan (PBFT). Neonatal outcomes of extremely preterm infants from Taiwan: comparison with Canada, Japan, and the USA. *Pediatr Neonatol*. 2015;56(1):46-52.
18. Nuffield Council on Bioethics. *Critical Care Decisions in Fetal and Neonatal Medicine: Ethical Issues*. Plymouth: Latimer Trend&Company; 2006.
19. Seri I, Evans J. Limits of viability: definition of the gray zone. *J Perinatol*. 2008;28(Suppl 1):S4-S8.
20. EXPRESS Group, Fellman V, Hellström-Westas L, et al. One-year survival of extremely preterm infants after active perinatal care in Sweden. *JAMA*. 2009;301(21):2225-2233.
21. Vergahen E, Sauer P. End-of-life decisions in newborns: an approach from the Netherlands. *Pediatrics*. 2005;116(3):736-739.
22. Ramsey SM, Santella RM. The definition of life: a survey of obstetricians and neonatologists in New York City hospitals regarding extremely premature births. *Matern Child Health J*. 2011;15(4):446-452.
23. Meadow W, Lantos J. Moral reflections on neonatal intensive care. *Pediatrics*. 2009;123(2):595-597.
24. Hammerman C, Kornbluth E, Lavie O, Zadka P, Aboulafia Y, Eidelman AI. Decision-making in the critically ill neonate: cultural background v individual life experiences. *J Med Ethics*. 1997;23(3):164-169.
25. Larcher V, Craig F, Bhogal K, Wilkinson D, Brierley J. Royal College of Paediatrics and Child Health. Making decisions to limit treatment in life limiting and life-threatening conditions in children: a framework for practice. *Arch Dis Child*. 2015;100(Suppl 2):s3-s23.
26. Lam HS, Wong SP, Liu FY, Wong HL, Fok TF, Ng PC. Attitudes towards neonatal intensive care treatment of preterm infants with a high risk of developing long term disabilities. *Pediatrics*. 2009;123:1501-1508.
27. Sullivan J, Gillam L, Monagle P. Parents and end-of-life decision-making for their child: roles and responsibilities. *BMJ Support Palliat Care*. 2015;5(3):240-248.
28. American Academy of Pediatrics Committee on Fetus and Newborn, Bell EF. Noninitiation or withdrawal of intensive care of high risk newborn. *Pediatrics*. 2007;119(2):401-403.
29. Cuttini M, Rebagliato M, Bortoli P, et al. Parental visiting, communication, and participation in ethical decisions: a comparison of neonatal unit policies in Europe. *Arch Dis Child Fetal Neonatal Ed*. 1999;81(2):F84-F91.
30. Feltman DM, Du H, Leuthner SR. Survey of neonatologists' attitudes toward limiting life-sustaining treatments in the neonatal intensive care unit. *J Perinatol*. 2012;32(11):886-892.
31. Silberberg A, Gallo JE. Managing end-of-life decisions in critical infants: a survey of neonatologists in Cordoba, Argentina. *Acta Paediatr*. 2013;102(10):e475-e477.
32. Singh J, Fanaroff J, Andrews B, et al. Resuscitation in the "gray zone" of viability: determining physician preferences and predicting infant outcomes. *Pediatrics*. 2007;120(3):519-526.

How to cite this article: Silberberg A, Villar MJ, Torres S. Opinions of Argentinean neonatologists on the initiation of life-sustaining treatment in preterm infants. *Health Sci Rep*. 2018;1:e100. <https://doi.org/10.1002/hsr2.100>